Assessment of the Capacity of Multistrand Post Tensioned Ground Anchorage

Problem

The Corps needs methods to determine the remaining life and the present (reduced) capacity of hydraulic structures containing corroded multistrand anchors. Multistrand anchors provide additional capacity for lock walls and other hydraulic structures to handle unexpected or changed load conditions. Some anchors are beginning to fail due to corrosion and other possible failure mechanisms. The details of exactly how and where these defects evolve are poorly understood. Improving this understanding is important to the development of a non-destructive evaluation (NDE) system for early defect detection and for characterization that infers the remaining cross-section area (RCSA) of the anchor tendons.

John Day Lock anchor caps and exposed anchor tendons

Approach

The primary objectives of this R&D project are to develop engineering procedures to estimate the present state of load-carrying capacity of the ground anchorage, to estimate remaining life of the tendon, and to establish the deterioration of anchorage capacity (with time), all while making use of project data, ERDC laboratory generated data, and/or nondestructive measurement techniques (NDT). Analytical, laboratory, and field testing efforts will all be used in the development of this engineering methodology and resulting analytical model. Probabilistic procedures will be used to formally quantify uncertainties for the primary variables. Lastly, procedures to extend the life of deteriorating multi-strand tendons are to be investigated.

Products

An analytical model will be developed using these procedures for a probabilistic stability assessment of a hydraulic navigation structure containing corroded post-tensioned anchors so costly anchorage replacement of ground anchorage can be delayed until absolutely needed. An NDT procedure for the measurement of corrosion in multistrand post tensioned anchors will also be developed. The probabilistic anchor model will be implemented in an engineering stability software.

Corroded anchor allowing water flow during lockage

Benefits

Non-destructive techniques for measuring RCSA and probabilistic models for assessing the status of existing anchors will provide a more accurate and less conservative estimate of remaining life and reduced capacity of multistrand anchors. This will result in significant savings by extending the time until costly anchor replacements are required.

POC: Dr. Robert Ebeling
Robert.M.Ebeling@usace.army.mil
Charles E. “Eddie” Wiggins
Charles.E.Wiggins@usace.army.mil